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## A psycho-ecological model for the simulation of interpersonal relations: system development and some empirical results from teacher training

BERNHARD BIERSCHEK

### 1. Some Psycho-ecological Viewpoints

When a society plans the upbringing and education of its members, irrespective of age and level, one absolute requirement must be that it develops their ability for self-determination. A psycho-ecological approach to a study of the individual's self-cognition (perception and evaluation) and self-determination (i.e. development of plans of action) focuses on the mutual relations existing between the individual and his environment and the dynamics of these relations. More concretely, the aim is to develop a system of simulators that can be used in, for example, teacher training, so that the teacher can become an active, creative member of teaching groups, where everyone is given the chance of creating his own learning environment.

Since the beginning of the 1970s, laboratory techniques have been increasingly discussed and used in educational and psychological research for controlling complex interaction processes. We try to create a fruitful interaction between adviser and advice-seeker, tutor and student, teacher and pupil, consultant and teacher. The development of new methods that give both parties the opportunity of analysing and diagnosing how their own and other people's behaviour develops and functions must be an important step forward. The development of methods based on behavioural science stresses the importance of systematic and detailed self-observation, i.e. an analysis of the consequences of a particular action. A person must first be made aware of (observe) and understand (analyse and synthesise) a course of action before previous experiences can lead successfully to behavioural change. We start from the assumption that a human being accumulates between birth and adulthood behavioural strategies for the purpose of being able to meet different situations. We have therefore concentrated on the problem of developing an instrument



that will permit the study of (1) which strategies the individual uses, (2) which of them are available in different situations and (3) at different times.

The successful development of instruments for simulating educational and psychological phenomena naturally depends on how much we know about the factors that influence the individual's readiness to take the rôle of e.g. teacher and pupil, leader and subordinate or sender and receiver of information, etc. These questions require experimental investigation.

## 2. A Psycho-ecological Model for the Simulation of Interpersonal Relations (SIR)

In educational and psychological contexts the teacher's perception and evaluation of a given teaching situation determine whether or not he succeeds in correctly predicting the behaviour of a pupil or the consequences of alternative courses of action. Thus the fundamental aims of teacher training should be to develop the teacher's self-perception and "human competence". He must be trained to sensitivity in apprehending the implications of a train of events. His ability to develop flexible behavioural strategies in the interaction with pupils should be expanded. Training in human competence means that interacting persons must learn both to integrate given information and each other's cognitive systems (implicit models). A dynamic relation also means that information is integrated into existing models and that the interacting parties change as they learn things about each other's behaviour (see Hammond, 1972, pp. 285-327).

It is of fundamental importance for every form of education that a person learns to predict the consequences of the behaviour he has chosen. The ability to shape one's behaviour according to "pre-arranged hypotheses" and to develop behavioural strategies that result in a successful interaction between two or more persons in solving a common assignment is here defined as human competence. It presupposes that an individual can choose alternative strategies and that the individual can adapt his behaviour when the situation demands changes in behaviour. But it also presupposes patterns of behaviour which are compatible with a given set of criteria.

Deficient human competence occurs when the individual's behavioural strategies consist of separate steps that follow each other in a stereotyped or automatic fashion. Behavioural stereotypes (automated behaviours or routines) can then be defined as fixed behaviour or a fixed sequence of behaviours that are not accessible for analysis, diagnosis, and synthesis and can consequently not be influenced by information that the effects of a behaviour do not coincide with the expectations of the individual himself or others. However, many of the individual's behaviours are dependent on anticipated effects on

others and on the perception and evaluation of others. This circumstance can result in a vicious circle. The way in which different people regard each other and each other's behaviours is unfortunately all too often defined by relatively stable, cognitive structures (in extreme cases by a depersonalising-derealising syndrome, see Weckowicz, 1972, pp. 429-447). These need not be in agreement with a person's behaviour, since the assessment of an individual is largely determined by his functional behaviours. This is one reason why we want to study how a person utilises observed behaviours to make inferences in interaction situations.

Hartmann's (1958) concepts "automating" and "deautomating" appear to suitably describe the individual's ability for flexible adaption and conversely the loss of this ability. (For a more detailed discussion of the implications of the concepts, see Hartmann (1958).) To achieve deautomations it is probably necessary for the individual's attention to be directed at *different* behavioural functions.

To master problems with which he is faced in his profession, the teacher needs to have opportunity for "laboratory exercises", in which he can observe himself in interaction with pupils and distinguish structures in this interaction process that are meaningful to him. A psycho-ecological model for a simulation of interpersonal relations (SIR) should create the right conditions for designing a laborative teacher training, i.e. training based on the student teachers' own experiences. The core of this model should be an action-oriented behaviour simulation, the principles of which are shown in Figure 1. The model illustrates a case where two individuals are to learn a common assignment by cooperating with each other. Training in human competence in educational contexts means that a teacher and a pupil (by means of the experimenter's choice of pupil situations, see Chapter 3) are to learn each other's cognitive systems. The prime number states that a dynamic relation exists between the two systems, i.e.  $I_1$  changes as he learns things about  $I_2$  and  $I_2$  changes as he learns things about  $I_1$ .

Simulation of interpersonal relations according to the outline given in Figure 1 means that an individual can study his own behaviour in relation to the behaviour of others in solving a common assignment.

Simulated situations or events mediate a concrete experience and approximate reality to a greater or lesser extent. In addition, this kind of simulation demands of the individual that he be able to find immediate answers to changes that arise in his environment. A person in interaction with the simulator must also be able to predict at what point important changes occur. This requires the person to be able to focus his attention in a corresponding fashion. This prediction can, however, only be made in the form of probabilities depending on the nature of the assignment.



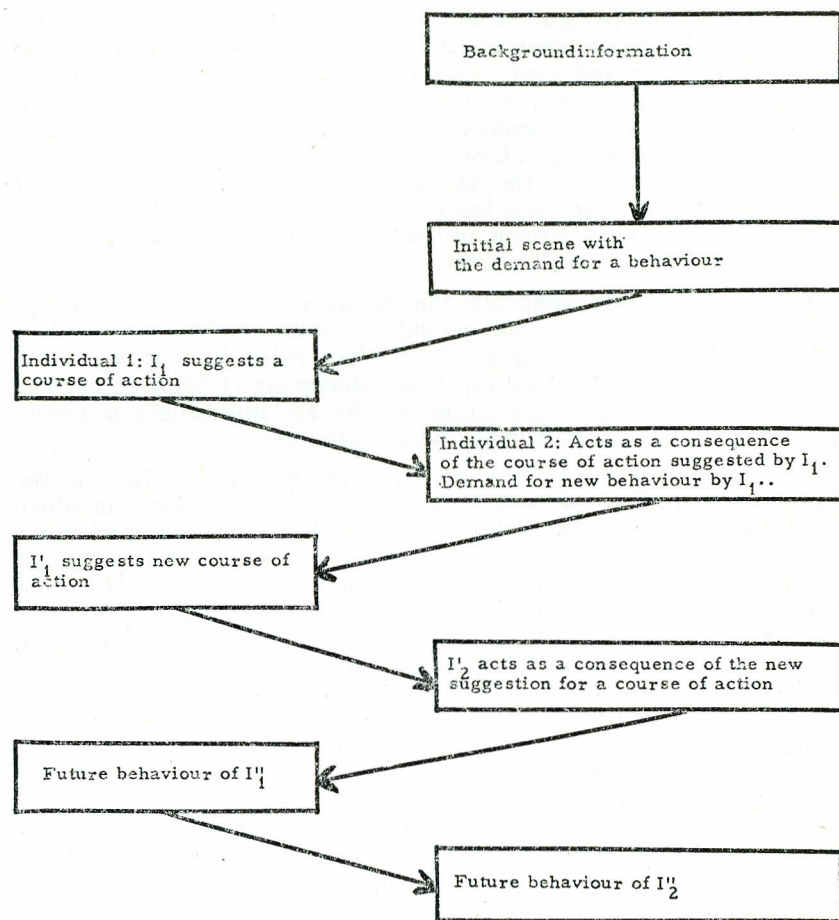


Figure 1. Outline of principles for an interactive behaviour simulator.

Simulation enables the student teachers to (1) increase their self-understanding, (2) practise the use of systematic self-observation, (3) learn intra-individual and inter-individual process analysis (knowledge of one's self and of the environment is from the point of view of system theory, a continuous process of structuring and restructuring, since an increase of knowledge presupposes some form of investigatory activity and the formation of new structures, which did not exist previously either in the environment or in the individual's cognitive system), (4) get extra training in self-diagnosis and self-change, (5) learn to synthesize and integrate experiences into the existing cognitive structure. Thus simulation could be an aid that can be used for

the development of the kind of skills that increase the ability of the teacher to (1) meet and observe groups and (2) add to his self-insight, (3) understand the behaviour and motives of himself and others and (4) develop adaptive patterns of behaviour that enable him to meet the demands made on him by different situations and problems (assignments).

### 3. Design and Construction of SIR

The first attempt at developing an interactive behaviour simulator (SIR) has been described in Bierschenk (1975) and Frost (1975). The model on which this development work has been based is described in Bierschenk (1976) and the successive revisions of the simulator in Frost (1976). We have tried to develop an interactive behaviour simulator that makes use of different models within behavioural science. Briefly, we can say that SIR starts with a problem situation that has been recorded on a video-cassette. Depending on the choice made by the student teacher and his suggestion for suitable action, the consequence is shown in the form of a pupil behaviour recorded on a separate video-cassette. In principle this functions in the following way:

We start with background information. This is intended to place the simulator in its context. The information given to the subject can be as follows: You should imagine that you are taking on a new fourth grade class this term. The headmaster has already informed you that one of the new pupils in the class, Göran Larsson, was in a remedial class in grade 3. Göran is intellectually normal but is very isolated and nervous.

It is the first day of term and you are on your way from the staff room to the classroom.

The initial scene illustrates the situation that you as teacher are faced with outside the classroom door. Mrs. Larsson and Göran are sitting there on two chairs. The mother introduces herself as Mrs. Larsson and Göran's mother. You shake hands with Mrs. Larsson, but Göran refuses to respond to your greeting. In this situation the mother says: "Göran is so terribly frightened, I'm sure he won't dare stay in the class when I go".

Here the scene is broken and you are instructed to suggest a course of action. You could, for example, say: "I try to make contact with the boy, but it's just as well if the mother accompanies him into the classroom", or something similar...

Following your suggestion for a course of action, a new scene shows the "consequences" of your suggestion. After Göran has in some way reacted by, for example, looking down at the floor when you start talking to him, this situation is again broken.



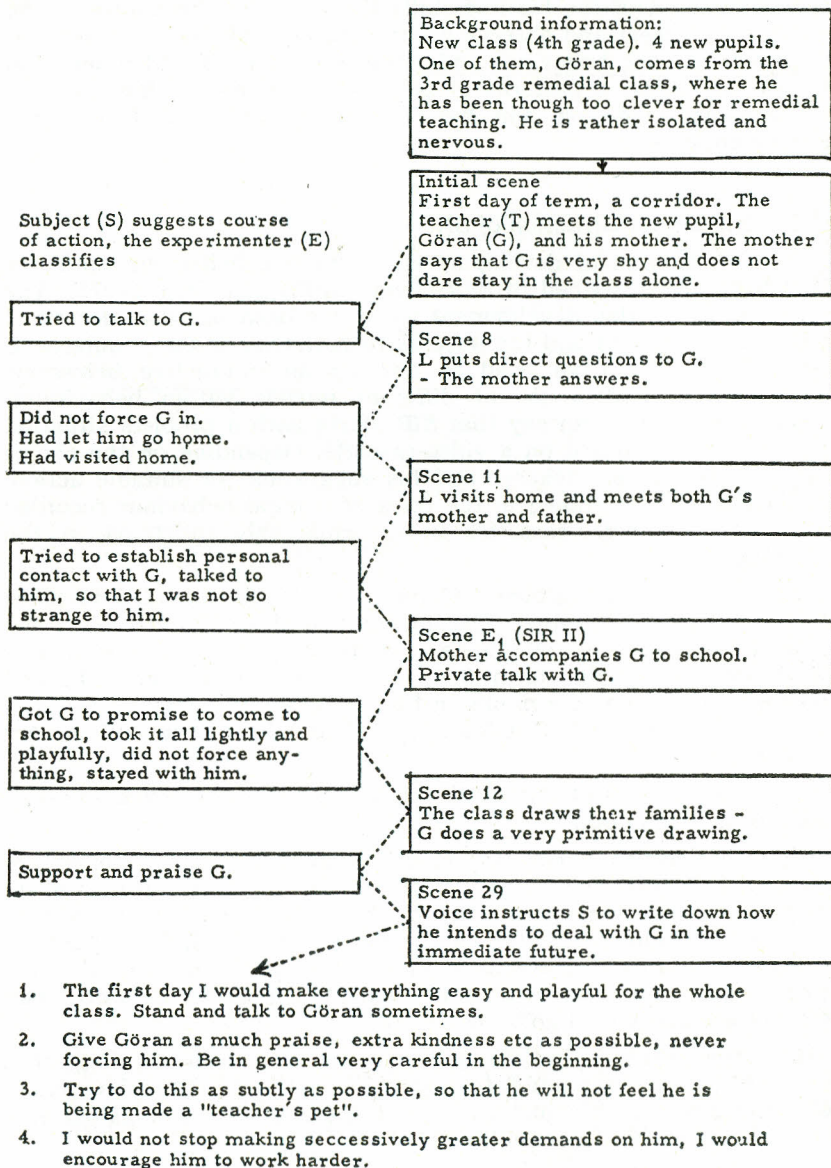


Figure 2. SIR I: Results of a simulated course of events based on the structure paradigm.

In this way you continue your interaction with the simulator until you reach the point when you succeed in getting Göran to answer positively to your attempts to make contact with him.

Each individual scene contains one or more clues. These have been chosen according to three paradigms taken from the science of behaviour. The hypothesis is that a definite inclination for action should emerge from the suggestions following a particular scene and that gradually a pattern appears that relates to a greater or lesser degree to one of the following paradigms: (1) the association paradigm, (2) the structure paradigm, or (3) the process paradigm. The scenes that primarily contain clues based on, for example, the first paradigm form a scene sequence or a track. Since the simulator has been built up in such a way that the video-recorded situations can be varied systematically in accordance with the principle models, it should be possible to study whether and to what extent student teachers work through the behaviour simulator by making use of one of the principle models. But it must also be pointed out here that it cannot be a question of an either-or, that the paradigms should be regarded as a continuum with deterministic and probabilistic poles.

In order to make the interactive behaviour simulator's way of functioning more concrete, Figure 2 presents the development of the simulated course of action in a subject where the structure paradigm appears to lie behind the suggested actions. So as to describe the assumptions underlying the construction, the suggested courses of action and the pupil behaviours shown are presented, together with an *a priori* assignment of the scenes to their theoretical paradigm. The descriptions have been taken from Frost (1975, pp. 8, 11, 13 and 26). It should be mentioned that it proved to be easier to anchor the consequences in the association paradigm and the process paradigm than in the structure paradigm. At present there are 86 pupil behaviours recorded on separate video-cassettes. An account of the concrete content of the scenes and their theoretical anchorage may be found in Bierschenk (1976) and Frost (1975, 1976).

#### Initial scene

##### SCENE 1

Mrs. Larsson and her son, Göran (G) are sitting on two chairs outside the door of a classroom. They give a passive impression—sit silently and have no contact with each other. Footsteps are heard approaching and the mother jumps. When she sees the teacher, she rises hastily and pulls G up from his chair, placing him beside her. G looks nervously at the floor and moves slightly behind his mother. The mother introduces herself as Mrs. Larsson and G's mother. The teacher greets the mother and then holds out his hand to shake hands with G. G retires behind his mother and refuses to shake hands. The mother says: "G is so terribly frightened; I'm sure he



won't stay here after I go". The scene is broken here and a voice asks: "What would you do now?"

#### SCENE 8

*Suggested course of action:* The teacher turns directly to G and asks him straight out if he thinks it is unpleasant to come to school. The teacher wants to see both how G reacts to a direct approach and to hear if he can give an explanation.

*Consequence:* The teacher asks G if he finds it strange and unpleasant to come to a new class. G looks at the floor and presses himself against his mother. As soon as the teacher has finished speaking, the mother answers in G's place. She says that G is always so frightened when there is something new and especially if she can't be there. The scene is broken when the mother stops speaking. The mother here gives G no chance to reply.

*Theoretical link to the theory of gestalt psychology:* The teacher wishes to get as much information as possible about G. In accordance with the principles of gestalt psychology the teacher concentrates on the entire personality of the pupil, i.e. posture, pitch of voice, gestures and facial expression are considered to be important components. By approaching G directly, the teacher tries to ask G about his anxiety and thereby employ another principle from gestalt psychology, namely confrontation. The aim is to expose G to "worry-provoking training". G is to work through his worry, although with the support of the teacher. In this here-and-now experiences are important. This training is intended to give G the opportunity to understand the process that is taking place within him more realistically.

#### SCENE 11

*Suggested course of action:* The teacher considers that he needs further information about G and his mother and their situation. He asks if he may visit them at home.

*Consequence:* The teacher and G's mother and father are sitting round a coffee-table. One can just hear a little "polite talk" and then the teacher asks: "Has G always been so uncertain and shy?" The mother throws a quick glance at the father, who is sitting silently and passively, and says that G has always been very careful and reserved and has never had any friends. She tells with embarrassment that G lived with her parents for three years when the family was in difficulties and G played so well with the animals on their farm. The mother relates that G's problems became worse when he returned to the family, since the children where they lived then were terrible and quite dangerous, so she couldn't let G play with them. G and his mother

were indoors most of the time. When the family moved to a new area where there were a lot of children, the mother thought that things would get better. But by then G did not dare and did not want to go out without his mother. The mother says that she and G like being indoors together best, that G is happy then. She says that sometimes it can be difficult always having G with her, such as when she goes shopping. The mother also says that when G started in the first grade, she had to accompany him to school and stay with him during the lessons for a whole term. She had found this very hard work and hopes it will be a bit easier this time when he starts in a new class.

The mother thinks admittedly that it is a little difficult having G tied to her in this way, but at the same time it seems as if she likes the tie and wants it to remain. During the entire conversation the father is silent and appears totally uninterested.

*Theoretical link to the theory of gestalt psychology:* The teacher tries to get as "whole" a picture as possible of G and his situation... As early as 1920 Köhler considered that only a fully implemented dynamic total perception that emphasises the dependence of the parts on the total qualities of the system can deal with the constantly shifting multitude of changeable phenomena in our psychic life.

#### SCENE 1 from SIR II:

##### Level E<sub>1</sub>

*Suggested course of action:* You ask the mother to accompany G to school and there you have a private talk with him.

*Consequence:* The teacher and G are sitting on a bench. The teacher is cautiously trying to make contact with G. The teacher notices an interest in reading and asks G if he reads comics. G mutters "yes". The teacher asks G if he likes Asterix. This produces an immediate positive reaction in G, who lights up and says, "Yes, a lot".

An open conversation about the characters in Asterix develops, in which G says that he admires a cartoon figure who can fight, which suggests the idea that G's aggressive instincts are inhibited.

*Theoretical link:* Scene E<sub>1</sub> was originally constructed for SIR II, but was placed here in accordance with the relation principle. The theoretical integration will take place in connection with the revision.

#### SCENE 12

*Suggested course of action:* Following the information he has received about G and his environment, the teacher decides to try once



more to get G into the class. He puts G at a desk at the back of the class and places his mother near him. The teacher has told G what the class is going to do, so he is well-prepared. The teacher asks the class to draw their families.

*Consequence:* The teacher says: "Now it will be exciting to see your drawings". The camera sweeps over a few benches, where pupils are working on colouring relatively detailed drawings. The camera then rests on G's naïve line drawing, in which a large mother figure dominates. A small father figure can be seen at the side and a small, dark, armless figure in one corner. G sits playing with the crayons, taking no interest in the drawing. We get a glimpse of his mother in the background.

*Theoretical link:* By letting G draw his family, the teacher wants to help him structure the situation and increase his awareness of himself and his situation. Wertheimer emphasises the importance of the situation. He considers that the structure in an experience is important. The gestalt-psychological importance of this action is that the structuring of situation and experience is made clearer. The purpose is to achieve small changes in G's consciousness. An "Aha" experience is striven for.

#### 4. Empirical Testing and plans for continued Research and Development

SIR has been developed in order that we might study how student teachers solve an educational and psychological problem. In every successful solution of human problems, the necessary prerequisites are: that the individual (1) has perceived the problem, (2) has at his disposal adequate problem-solving methods, and (3) has some idea of the expected result. If the individual's problem-perception is diffuse, it is assumed that no adequate problem-solving strategy can be chosen, which results in "random" problem-solving behaviours. If the individual has perceived the problem without having at his disposal a suitable strategy, this leads to "stereotype" behaviours. Not until there is a large covariation between all three components can there also be the necessary conditions for a development of human competence.

The first testing of SIR (SIR I) was carried out in the form of a pilot study in the spring term of 1975, in order to create an empirical basis for both a revision and planning of a more strictly designed investigation. A revised version (SIR III) was tested in the autumn term of 1975.

In the first testing 24 student teachers from the second term of the training for middle school teachers (M2) participated. In the second testing (SIR III) 10 student teachers participated, 5 from M2 and 5 from M6. The evaluation of both testings was carried out and re-

ported by Frost (1975, 1976). The results that will be presented are based on this evaluation. The testing of SIR I shows that the student teachers' suggestions for courses of action indicate a certain predominance of suggestions based on the association paradigm. When SIR III were tested a shift occurred. Now the structure paradigm is more dominating but there were also more E-scenes required. The number of students who have chosen a strategy that seems to be based on (1) the association paradigm (A), (2) the structure paradigm (S) and (3) the process paradigm (P) are presented in Table 1.

Table 1\* Choice of strategy in SIR I and III

Subject	SIR I Paradigm				SIR III Paradigm			
	A	S	P	E	A	S	P	E
1	00	100	00	00	20	80	00	00
2	50	25	00	25	33	17	00	50
3	25	50	00	25	36	18	09	36
4	40	60	00	00	38	38	00	25
5	75	25	00	00	20	10	00	70
6	67	00	00	33	25	25	38	13
7	50	25	25	00	18	04	09	64
8	20	60	20	00	20	60	00	20
9	67	00	00	33	17	33	25	25
10	33	17	33	17	25	17	17	42
11	67	00	00	33				
12	00	14	71	14				
13	20	00	60	20				
14	38	33	00	33				
Average	39	29	15	17	25	31	10	35

\*The values are proportions. The measure is a simple weight-expression  $\frac{a}{n}$  where  $a$  is the number of occurrences of scenes classified according to principle A, S or P and E;  $n$  is the number of scenes that the unique sequence of an individual contains. E indicates scenes which do not match a principle but are used to force the subject to give more specified comments, detailed information or to break a mental block in the subject.

After a close examination of the suggested courses of action, the following division could be made:

1. Action strategy, i.e. student teachers who control the development of the action. This indicates field independence.
2. Stereotype actions, i.e. the action is not developed. This indicates field dependence.



3. Random actions, i.e. the actions are unconnected. This indicates a lack of sensitivity to the development of the action.

The general impression, however, is that the student teachers display no uncertainty in their perception of the problems presented in the scenes. With a few exceptions the scenes are assessed both logically and realistically. The pupil behaviours that the student teachers were shown as a result of the suggestions for action given have been judged as being in good agreement with the expectations and as probable pupil behaviours. The students experience the interactive behaviour simulator as a "positive surprise". No problems of identification could be traced. The student teachers themselves consider it very easy to act the part of the teacher. They speak directly to the pupil and take it all "deadly seriously".

The concluding interviews show clearly that the student teachers prefer to meet this type of problem situation in a simulator rather than having to act in reality. They find it easier and safer to analyse the problem in a simulator. In addition the student teachers consider that the course of events and the measures taken in a real situation would "in all probability" be the same as the course of events and the measures taken in SIR I.

The results from the testing of SIR III agree on all essential points with the results from the testing of SIR I. One new result, however, is that it seems to be very important that the students can see "real" consequences as a result of the action they have suggested. If the courses of action suggested by the student teachers lead to illogical or improbable events, this will result in frustration and confusion and a sceptical attitude towards the simulator (see Frost, 1976, p. 87).

On both testing occasions some student teachers also proved to have different needs for empathy, i.e. they expressed a need for subjective references. While the construction of the simulator: scene<sub>1</sub>—suggested action<sub>1</sub>—scene<sub>2</sub>—suggested action<sub>2</sub>—etc., introduces an analytical technique, i.e. a kind of distancing effect that was perceived by some students, others wished to see a "film", i.e. an uninterrupted course of events. By studying the student teachers' comments to the separate scenes and their references to whether they would like to see a complete sequence and whether they feel the simulation to be different to a normal situation, it would be possible to create quantitative measurements that could then be placed in relation to the type of pupil behaviour that has evoked such comments, the progress of the action and the strategy chosen. The following hypothesis could be tested in this connection: the clearer the student teacher's action strategy, the less the need for empathy and the converse.

To make the simulator a more objective and generally useful instrument, we need to construct an instrument for panel assessments of the scenes and a categorisation instrument for coding the student teachers' suggestions for action.

A third testing of the interactive behaviour simulator's way of functioning and usefulness for educational experiments and demonstrations was carried out during the spring term of 1976. This testing has been carried out and reported by Arte (1977) and concerns mainly SIR II. SIR II is used both in the training of remedial teachers (line 1) and in the training of non-academic junior school teachers. According to Arte (1977) a construction of "scene pools" is planned, both to increase the flexibility of SIR II and to provide greater freedom for the subsequent group discussions. In the long run the production of a detailed teacher's handbook would make it easier to use SIR (I, II, III) in various educational contexts. The experiences so far have been summarised (Arte, 1977, p. 48) in the following way:

"The simulation technique has been experienced very positively by both me and the students and it would be desirable to have alternative relations processed in the same way. The most topical plans just now concern the possibility of constructing a simulation of relations in connection with a pupil acting out his aggressions."

The result of the pre-study should provide a good starting-point for a systematic development of the simulator model described above and for experimental studies of the actions taken by different categories of teachers when faced by various simulated teaching situations.

Eventually a further development of the simulation model that has been presented in this article and a testing of the hypotheses put forward should lead to a mapping of which behavioural models (a system of cognitive components) form the foundation of a teacher's behavioural strategies. Moreover, by continual and repeated measurements we should be able to get an idea of the effect of the teacher training on the student teachers' perception and evaluation of teacher-pupil relations and their ability to develop behaviour strategies likely to increase the pupils' self-confidence and human competence.

By constructing an interactive behaviour simulator in agreement with different behavioural science models, we hope to be able to study whether and to what extent the implicit cognitive structure of individual people can be approximated by means of these models. Since all exchange of knowledge and information between persons can only take place within certain limits of tolerance (defined by implicit models), a study of the basic structures of different cognitive systems is of fundamental importance for all educational activities.

Although we must assume that different cognitive systems are based on different experiences and varied ways of abstracting knowledge, an interaction between teacher and pupil presupposes covarying cognitive systems. The work planned on questions concerning cognitive psychology includes a study of alternative actions, condition, outcome (result) and evaluation of results. In addition we intend to study whether and to what extent different personality factors are of



importance to the individual's choice of a particular strategy of action.

By means of panel assessments, the video-recorded situations will be classified according to different basic paradigms (clue systems). In this way they will be given an objective base. A category system should make it possible to classify different suggested actions in an objective (reliable) way. Without going into details, it can be mentioned that we intend to study probabilities for actions by (1) forming matrices for "situation  $\times$  suggested actions" and the effect of different simulation experiments by (2) forming matrices for "suggested action  $\times$  clue". In this way we should get as a result "situation  $\times$  clue" matrices, as a representation of individual's cognition of the connection between basic paradigms and pupil situations.

A pre-study would also indicate whether and to what extent a particular personality structure covariates with the individual's choice of a particular basic model. By means of a validation experiment, in which different groups of student teachers are given special training in the basic behavioural science models on which the construction of the simulator is based, we plan to study how far the simulator permits inferences to be drawn regarding the student teachers' cognitive structure.

Experiences from teacher training have shown that students with an apparently vaguely defined self-image have substantial problems in their relations with pupils and teacher trainers. Increased knowledge in this area is of great importance and will have direct implications for both personality-developing teacher training programmes and for future training models, above all for social professions such as teaching.

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## REACTION

It is hoped that the articles will provoke thought and comment about classroom decision-making.

Replies and articles for possible publication in a future issue of the Journal are welcome—especially from practising teachers.

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